Aerated lagoon

View of wetland cells

Inlet pipe to wetland cells

Horizon Facility Statistics	
Nearest Town:	**Eckert**
County:	**Delta**
River Basin:	**Saint Vrain**
Receiving Water Body:	**Surface Creek**
Year Online:	**1988**
Population:	**220**
Elevation (feet):	**5400**
Design Flow (mgd):	**0.015**
Average Flow (mgd):	**0.010**
Size (acres):	**1**

Facility Description

The wastewater treatment facility consists of two aerated lagoons, a settling pond, a surface flow wetland followed by a meadow area. Chlorine disinfection can be provided as needed prior to discharge from the facility.

Background Information

The Horizon Nursing Home treatment wetland is the oldest recorded treatment wetland in Colorado. The decision to incorporate a wetland system into this treatment facility was based on costs and aesthetics. Dr. Hammer, a wetland scientist, designed this system. At the time that the Horizon wetland was designed, there were only 11 other treatment wetlands in the United States.

Energy Analysis

Energy consumption in this system is primarily due to aerators in the lagoons. A 3hp aerator in the primary lagoon and a 1.5 hp aerator in the settling pond are operated 24 hours and day, 7 days a week.

Wetland Design

Design Methods

This system was designed over 12 years ago during the early years of treatment wetland use. At the time that the Horizon wetland was constructed, only 11 other treatment wetlands were being used in the United States. First-order decay functions were assumed for BOD and TSS removal. Temperature dependent reaction coefficients were used.

Objectives

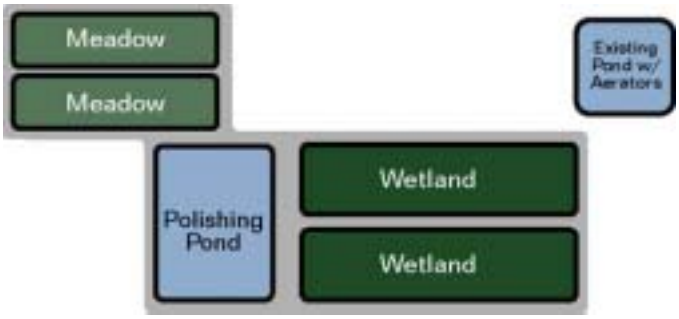
In addition to typical domestic waste, the wastewater effluent from this institutional facility contains greases (the kitchen does not have a grease trap), pharmaceuticals, and cleaning products. High BOD and TSS amounts in the lagoon effluent were resulting in values that exceeded permit limitations.

Size

The wetland system consists of two parallel wetland cells, that are 100’ by 50’ each. The effluent from the wetland cells flows into a 100’ by 60’ meadow area.

Shape

The Horizon wetland cells are rectangular, with a direct flow path.



Hydraulics

The inflow mechanism to the wetland is a standard gated pvc irrigation pipe. An HDPE liner runs the full length of the wetland cells to prevent interaction with groundwater. The liner was keyed in at the edges with sandbags to prevent exposure to the sun. The collection pipe is a gated irrigation pipe surrounded by coarse gravel. The water level typically operates at 18” in the wetland and can be adjusted with weir plates.

Treatment Goals

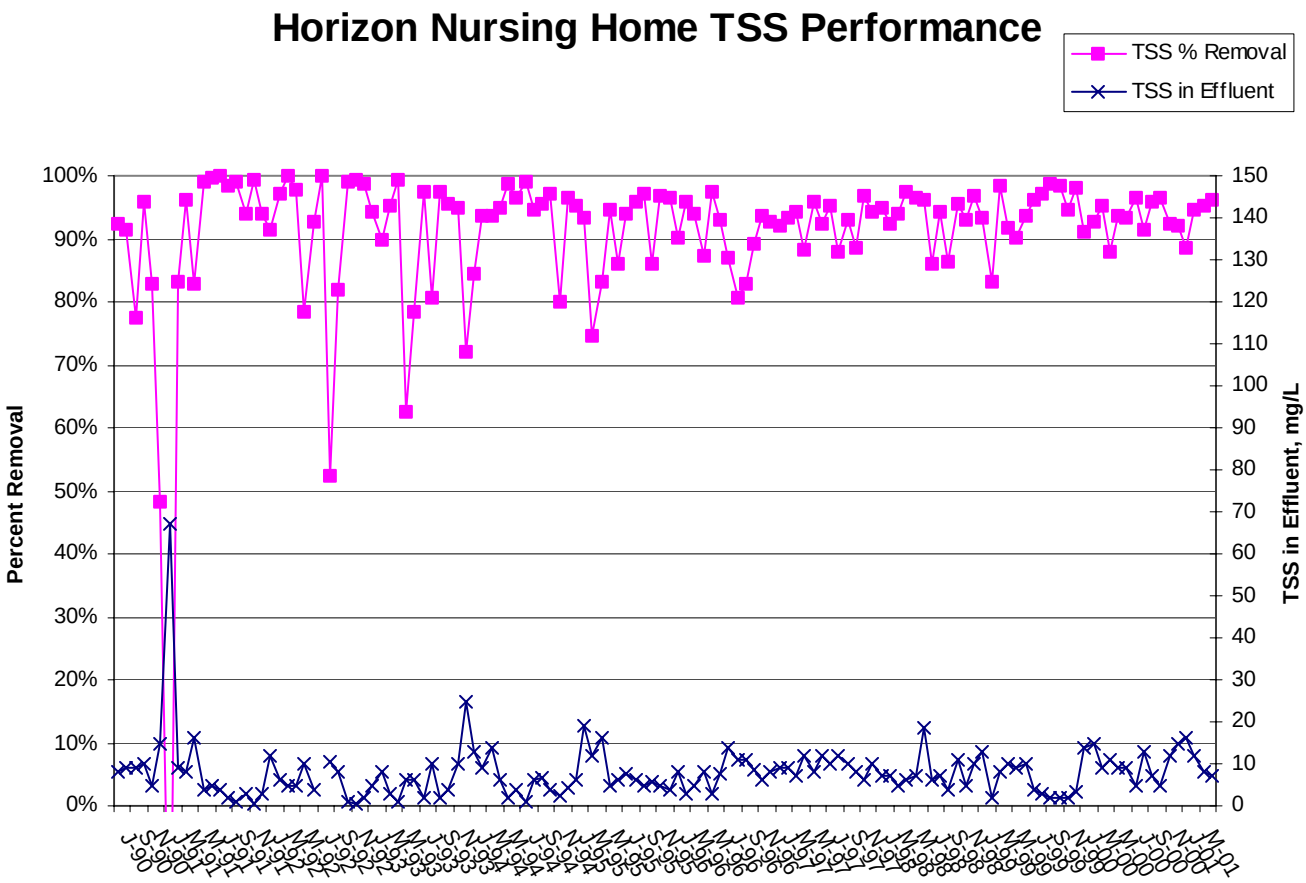
Permitted Discharge Limitations	
Oil and Grease:	**10 mg/l (Daily Max)**
$CBOD_5$:	**25 mg/l (30-day ave)**
BOD_5 Removal:	**85%**
TSS:	**105 mg/l (30-day ave)**
PH, su (min – max)	**6.5 – 9.0 (Daily Max)**
Chlorine Residual:	**0.5 mg/l (Daily Max)**
Fecal Coliform Bacteria:	**6,000 organisms per 100 ml (Daily Max)**

Water Quality Data

This system has been in operating in compliance of its discharge permit for over 12 years.

TSS Data

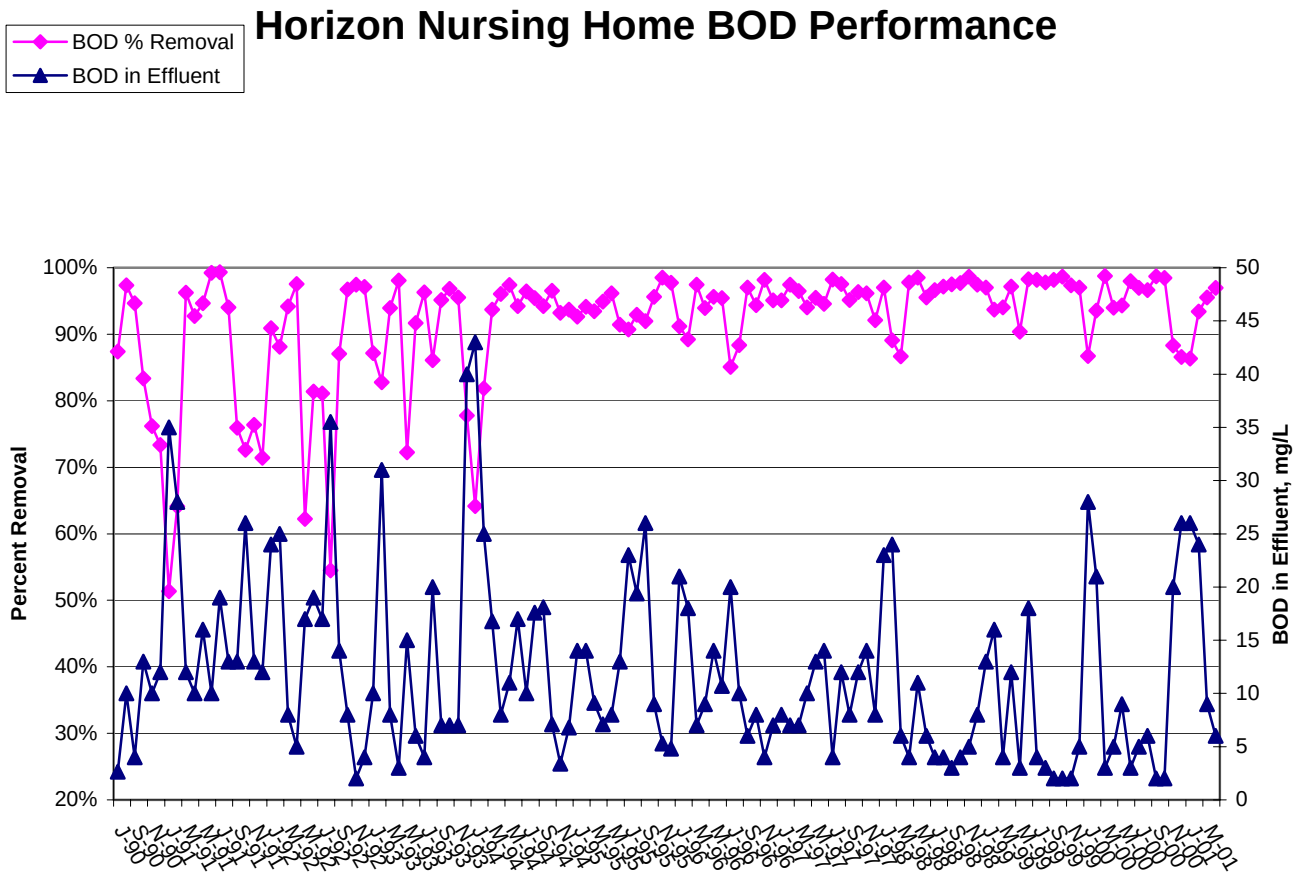
The TSS graph plots the percent removal on the left axis and TSS in mg/l in the effluent on the right axis. The average monthly TSS in the influent, since the wetland implementation, has been 195 mg/l and the average



monthly effluent has been 8 mg/l.

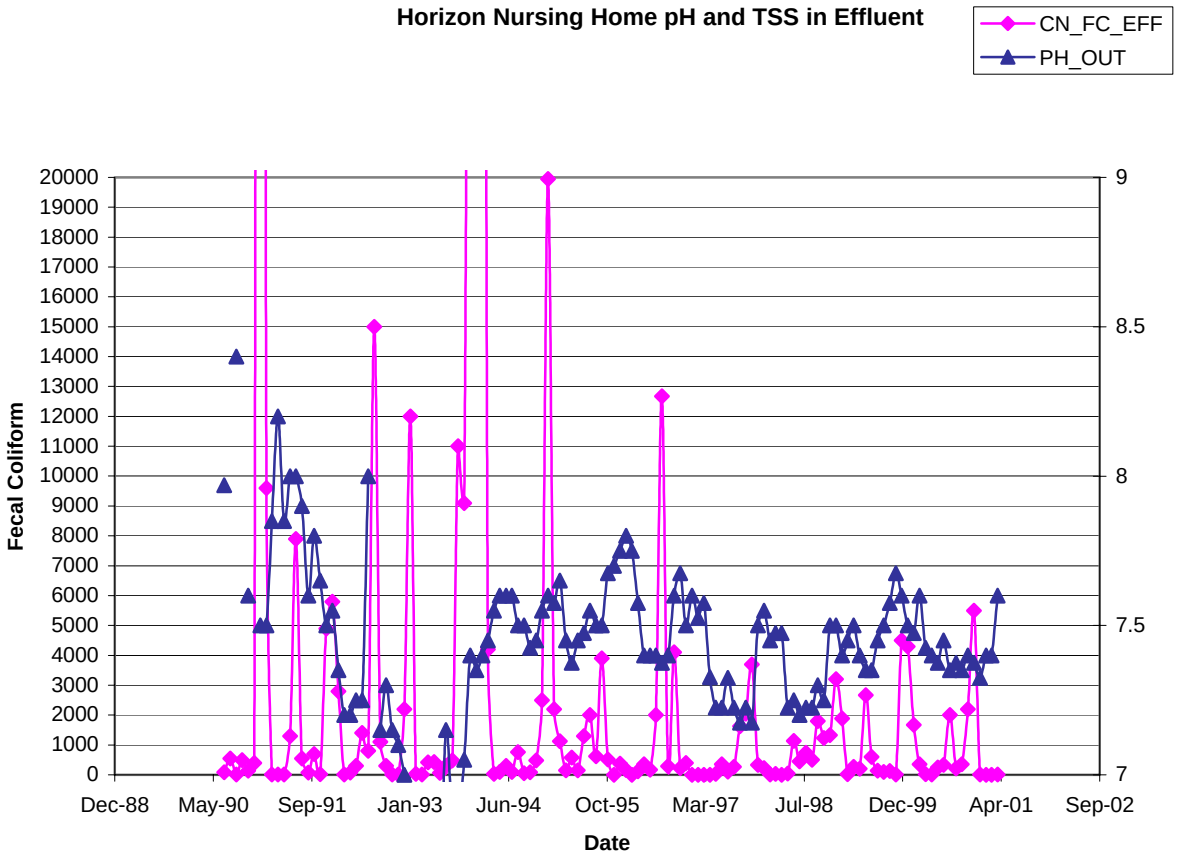
BOD Data

The BOD data is plotted similarly to the TSS data, with mg/l in the effluent on the right axis, and percent removal on the left axis. The average monthly influent amount has been 213 mg/l and the average monthly effluent amount has been 12 mg/l.



pH and Fecal Coliform

Data for these two categories have been plotted on the same graph. Data reflect the quality of the effluent; no influent measurements are taken for these parameters. The pH values plotted are an average of the minimum and maximum 30-day values that are reported in the monthly reports. Since the wetland implementation, pH values have consistently stayed within the allowable range of 6.5 to 9. The average fecal coliform value reported in the effluent since 1990 has been 1325.



General Ecological Setting

The landscape surrounding Eckert is generally irrigated agriculture including most row crops, irrigated pastureland and hay fields and associated farm or ranch facilities. Natural areas are shrubland with basin big sagebrush often dominating the shrub cover. This cover often occurs mixed with grasses.

Cell Vegetation

The two wetland cells support identical wetland vegetation. Cattail (*Typha latifolia*) dominates about 80 percent of the cells. Reed canarygrass (*Phalaris arundinacea*), duckweed (*Lemna minor*), lady's thumb (*Polygonum persicaria*), prickly lettuce (*Lactuca seriola*) compose the remaining 20 percent of the wetland vegetation.

Planting/Seeding

Cattails from nearby ditch cleaning were planted in the spring. Overburden, also from the ditch cleaning, was used as an organic amendment to help with plant establishment.

Weeds

No noxious weeds were identified during the site visit.

Wildlife

The constructed wetland is located adjacent to a residential area and subsequent human activity. The general wildlife habitat and habitat diversity are low to moderate. Fauna likely to use the wetland include songbirds, deer mice, muskrat, raccoon, and deer. Total functional points were 44% of the total possible, and it rated as a category III wetland.

Muskrats have been an issue at this site. The operator trapped 20 muskrats from the site in one year. In order to prevent damage to the wetland berms, a metal exclosure was placed around the wetland cells in the spring of 1999. This appears to be working.

Wetland Biodiversity Functional Assessment

Wetland Biodiversity Functional Assessment.

Function and Value Variables	Functional Points (0.1 to 1)	Possible Points
General Wildlife Habitat	0.5 (mod.)	1
General Fish / Aquatic Habitat	0.0	1
Production Export / Food Chain Support	0.3 (low)	1
Habitat Diversity	0.2 (low)	1
Uniqueness	0.2 (low)	1
Total Points	2.2 (44%)	5
Wetland Category (I, II, III, or IV)	III	

Human Use

In summer 2000, the Youth in Natural Resources with the Colorado Department of Natural Resources toured the facility as part of a study of wastewater systems. This wetland has moderate aesthetic value.

Maintenance Issues

Water levels of the wetland are raised each winter to inhibit freezing. Each spring the cell vegetation is burned to remove litter and stimulate plant growth. Odor problems due to sludge in the wetland have been experienced at this site. After 12 years of operation, the sludge layer in the wetland was about 1'. This layer was removed during the spring of 2000.

Overall Site Comments

This wetland functions as intended and has good vegetation cover. Historical data show that this wetland system has consistently and reliably operated within discharge permit requirements.